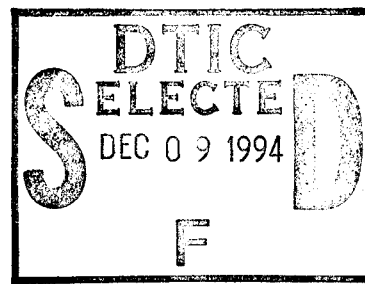


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What Are the Impacts to National Security for the Department of Defense to Comply With the Mobility Fuel Requirements in the Clean Air Act of 1990?

Colonel
James E. Wright
United States Army



Faculty Research Advisor
Lieutenant Colonel Joseph Rouge, USAF

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The Industrial College of the Armed Forces
National Defense University
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WHAT ARE THE IMPACTS TO NATIONAL SECURITY
FOR THE DEPARTMENT OF DEFENSE TO COMPLY
WITH THE MOBILITY FUEL REQUIREMENTS
IN THE CLEAN AIR ACT OF 1990?

by

COLONEL JAMES E. WRIGHT, USA

The Department of Defense's (DoD) strategy to minimize the number of bulk fuels conflicts with provisions of the Clean Air Act Amendments of 1990 (CAA-90). When DoD uses JP-8 in ground vehicles, it must meet the Environmental Protection Agency regulations for diesel emissions. Diesel fuel can't exceed 0.05 percent sulfur by weight, but the specification for JP-8 allows 0.30 percent sulfur by weight. So ground units continue to use diesel fuel in CONUS and convert to JP-8 during deployment. This will affect readiness because JP-8 cleans diesel residue from fuel systems and requires a couple of fuel filter changes to eliminate the problem. Is this conflict a show stopper or perhaps the apparent conflict is really not a problem at all?

My premise is that DoD can overcome this conflict by using Low Sulfur JP-8 to ensure high readiness. Two potential obstacles could prevent setting up that policy. If sufficient quantities of Low Sulfur JP-8 aren't available, then implementation is irrelevant. Prohibitive cost could also make this option infeasible. Other options are also explored. In summary, the DoD can retain the great operational and environmental advantages of a single fuel on the battlefield by switching to Low Sulfur JP-8. Low Sulfur JP-8 may offer similar benefits to commercial airlines and the transportation industry.

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WHAT ARE THE IMPACTS TO NATIONAL SECURITY
FOR THE DEPARTMENT OF DEFENSE TO COMPLY
WITH THE MOBILITY FUEL REQUIREMENTS
IN THE CLEAN AIR ACT OF 1990?

INTRODUCTION

The Department of Defense's (DoD) strategy to minimize the number of bulk fuels conflicts with provisions of the Clean Air Act Amendments of 1990 (CAA-90). Is this a case of two government policies passing like ships in the night? Or perhaps the apparent conflict is really not a problem at all?

Fuel personnel frequently title the DoD strategy to minimize the number of fuels as "single fuel on the battlefield." For example, aviation and ground units in a theater all receive JP-8 (or similar kerosene jet fuel) instead of multiple fuels such as JP-4, DF-2, and motor gasoline. Unfortunately, JP-8 and other kerosene jet fuels exceed the Environmental Protection Agency's (EPA) sulfur limits when used as a ground fuel.

United States policy makers must resolve this conflict between national security strategy and environmental security. Potential DoD options to eliminate the conflict or reduce the impacts are:

- o Option 1: Limit the Single Fuel Policy to Overseas.

Units continue to use JP-4 and DF-2 while located in the United States. Convert them to JP-8 following deployment notification,

during deployment processing, or after deployment to an overseas theater.

- o Option 2: Change to a Low Sulfur Kerosene Jet Fuel.

DoD can convert to a kerosene jet fuel that meets the CAA-90 requirements. Two possibilities exist: use an existing low sulfur kerosene jet fuel that meets the Clean Air Act sulfur emission standards or ask refineries to produce one.

- o Option 3: Seek an Enforcement Discretion from the Environmental Protection Agency (EPA). If DoD can't meet the CAA-90 standards, then ask the EPA discreetly not to enforce it. The EPA can't exempt agencies from the law, but they can provide written enforcement discretion. If an agency operates within the written guidelines, then the EPA can discreetly look the other way. An enforcement discretion also makes sense if DoD can meet the CAA-90 standards, but the procurement cost of Low Sulfur JP-8 is prohibitive.

- o Option 4: Not Comply with the CAA-90. If compliance with the CAA-90 significantly affects national security, DoD could choose not to comply. After all, the Unitary Executive Doctrine prevents one government agency from suing another.

- o Option 5: Use an Alternative Energy Fuel. Examples of alternative energy fuels are electricity, natural gas, and methanol.

My premise is that DoD should use Low Sulfur JP-8 to ensure high readiness. Two potential obstacles could prevent setting up that policy. If sufficient quantities of Low Sulfur JP-8 aren't

available, then implementation is irrelevant. Prohibitive cost could also make this option infeasible. In summary, the DoD gains great operational and environmental advantages by switching to Low Sulfur JP-8. Low Sulfur JP-8 may offer similar benefits to commercial airlines and the transportation industry.

SINGLE FUEL ON THE BATTLEFIELD

DoD's Concept. Defense policy envisions U.S. military forces using a single fuel to maintain readiness and enhance sustainability. Because aviation turbine fuels like JP-8 don't comply with the sulfur standards of the CAA-90, the full intent of the policy can only be met overseas. This causes petroleum logistics planners like myself great concern.

U.S. Forces overseas use one fuel on the battlefield. For reasons unique to each theater, combatant commands use the following as their single fuel:¹

- o U.S. European Command (EUCOM) = JP-8
- o U.S. Central Command (CENTCOM) = Jet A-1
- o U.S. Southern Command (SOUTHCOM) = JP-5
- o U.S. Pacific Command (PACOM) = JP-8

DoD will complete its overseas conversion to a single fuel in 1994; the Continental U.S. (CONUS) conversion is over 50 percent complete. Current EPA regulations cause DoD to limit CONUS JP-8 use to aviation only.

The Quest for a Single Fuel. According to Lieutenant Colonel Russell Garrett's 1993 research paper, the single fuel

idea originated as far back as 1934. Brigadier General Jimmy Doolittle advocated the development of a 100-octane aviation fuel for all equipment; the standard fuel used in military aircraft was 75-octane.² 1986 renewed the quest for a single fuel on the battlefield because of two separate problems.

The Aviation Problem. The U.S. Air Force was trying to find a safer fuel to use in its aircraft based on its experiences in Vietnam. During the Vietnam War, the Air Force lost many aircraft due to fuel fires after being hit by enemy ground fire. The Air Force found that many of these losses resulted from using JP-4, a highly combustible aviation fuel; less flammable kerosene-jet fuel like JP-8 would reduce aircraft losses.³

The Ground Problem. Army fuel problems involved the M-1 tank. During the late 1970s and early 1980s, the Army fielded the M-1 Abrams tank to various armor units in Germany. A turbine engine designed to run on diesel fuel powers the M-1 tank. Armor units in Europe experienced winter starting problems using DF-2. DF-2 is diesel fuel that forms wax crystals--its cloud point--in temperatures below 9°F. Wax particles clog fuel lines and filters, thus preventing the tank engines from starting or running. Different grades of diesel fuel, such as DF-1 or DF-A, would solve the problem, but they were not available in Germany.⁴

Consensus on JP-8. When the Air Force approached the Army to discuss the possibility of converting aviation requirements

from JP-4 to JP-8, the Army concurred. The Army further proposed using JP-8 as a substitute for DF-2 in ground vehicles because JP-8 is a kerosene-based fuel and functions well in diesel powered vehicles. Therefore, JP-8 can be a single fuel for both aviation and ground assets on the battlefield. The Army and Air Force reached consensus.

Since the M-1 tank has a turbine engine, JP-8 could power it and simultaneously solve the cold weather starting problem. JP-8 functions in temperatures down to -40°F versus 9°F for DF-2. So JP-8 helps turbine and diesel engines during cold weather.

JP-8 offers significant operational flexibility, safety, simplicity, and seamless petroleum support. Flexibility improves because any ground vehicle or aircraft can use the same fuel. Lower flammability improves equipment survivability and personnel safety. Eliminating operational checks simplifies refueling and helps prevent commingling of fuel types. Petroleum support becomes seamless when joint and combined units can use the same fuel in their aircraft and vehicles. In essence, JP-8 strengthens national security via enhanced readiness and sustainability.

Why Not JP-5 as the Standard? JP-5 isn't a normal refinery product, has limited availability, and isn't suitable for DoD-wide use.⁵ However, JP-5 is the Navy's standard aviation fuel because of its high flash point--the temperature where combustion occurs easily. JP-5 is safer for shipboard use with a flash point of 140°F; JP-8 and Jet A-1 have flash points of 100°F. If

JP-5 ignites, its flames spread slow enough for a person to walk away from it.

Caveat on Single Fuel. All military forces still require limited amounts of gasoline to power equipment such as small generators. These can't operate on JP-8. The DoD minimizes this requirement with a policy to avoid purchase of new gasoline powered equipment. JP-8 eliminates diesel fuel from the battlefield, so we essentially have a single fuel on the battlefield. The question is, can we use it in CONUS for ground equipment?

THE CLEAN AIR ACT AMENDMENTS OF 1990 (CAA-90)

Purpose of CAA-90. The CAA-90 forms a major new Congressional initiative for control of air pollution in the United States. Although titled as amendments, most of the legislation describes completely new requirements rather than modifications to the Clean Air Act of 1977. Congress believes that pollution prevention is cheaper and more practicable than pollution cleanup. Consequently, they passed "command and control" legislation with quantitative emission limits, calendar deadlines, fee structures, and penalty clauses.⁶

Diesel Fuel Standards. Section 211(i) of the Clean Air Act and 40 Code of Federal Regulations (CFR) Part 80 require that all highway diesel fuel have a maximum sulfur content of 0.05 percent by weight and a minimum cetane index of 40. The effective date

was 1 October 1993. Aviation fuel, such as JP-8, must comply with the same standard when used in highway vehicles. In order for the EPA to monitor compliance, oil companies shall dye all diesel fuel blue, with a sulfur content greater than 0.05 percent. Consequently, all diesel fuel on public roads should have no dye.⁷ The cetane index measures fuel ignition delay characteristics; it isn't a problem for JP-8.

Where Does CAA-90 Apply? The CAA-90 requirements apply to all fifty states, U.S. possessions, and territories. Thus far, only Guam and American Samoa have approved exemptions. Alaska has a petition pending with the EPA. The EPA Administrator can exempt any person or source from the CAA-90 requirements; criteria are that compliance is infeasible or unreasonable due to unique geographical, economic, or local factors.⁸

DoD's forward deployed units can use JP-8 as a single fuel since CAA-90 doesn't apply outside the United States. However, U.S. national security strategy reduces the number of forward-deployed forces and requires an increase in our force projection capability to meet regional crises vital to our national interests. Thus, our deployable forces stationed within the United States (and territories) must comply with CAA-90 until they reach the overseas theater. I will discuss this problem in more detail later.

Penalties for Violating Sulfur Content Standards. The courts treat CAA-90 violations as civil offenses--administrative

in nature. CAA-90 violations may result in penalties up to \$25,000 per day besides forfeiture of any profit resulting from the violation. The maximum penalty per violator shall not exceed \$200,000, unless the EPA Administrator and the Attorney General jointly agree that a larger penalty is appropriate.

When federal employees act within the scope of their employment, they are not personally liable. But if they act outside their official capacity, they may be liable. For example, the courts convicted three Aberdeen Proving Ground supervisors for knowing about environmental hazards in 1986, but failing to take corrective action.

Establishing Liability. The EPA presumes that all parties in the fuel chain of custody are liable, until they can prove their innocence. For example, if the EPA detects the violation at a refinery, only the refiner is liable for the violation. However, if they detect the violation at a service station, the EPA presumes that the refiner, the distributor, the carrier, and the service station are all liable for the violation. For the DoD, this means proving that neither the agency, their employees, nor their agents caused the violation.⁹

Can the EPA Enforce Civil Penalties Against DoD?

Technically, the EPA can't enforce a fine against the DoD because the Unitary Executive Doctrine prevents one government agency from suing another. However, DoD policy mandates compliance with the EPA regulations to comply with the intent of the CAA-90.

Thus, DoD will pay fines they receive from the EPA. If the DoD leadership refuses to correct a violation or pay a fine due to a national exigency, the EPA can appeal their case to the President.¹⁰

Dyeing of Aviation Fuel. As noted earlier, the EPA requires industry to dye high sulfur fuels blue for easy identification. However, the EPA doesn't enforce the dyeing requirement on military jet fuel due to operational safety; it doesn't exempt DoD from meeting the sulfur limit of 0.05 percent. The reason for the EPA enforcement discretion is that DoD already dyes aviation gasoline blue to distinguish it from jet fuel. This provides fuel handlers visual confirmation that they put aviation fuel in piston driven aircraft and jet fuel in turbine engine aircraft. Using the wrong fuel in an aircraft engine would cause engine failure.¹¹

HOW SIGNIFICANT IS THE ENVIRONMENTAL THREAT?

It Affects National Security. Environmental threats are gaining attention at the national level. Les Aspin, former Secretary of Defense, created the Deputy Undersecretary of Defense for Environmental Security (DUSD(ES)) position. Leaders worry that environmental threats have an impact beyond national boundaries. For example, Iraq's destruction of the Kuwaiti oil fields during Desert Storm generated environmental damage throughout the Gulf Region. Another incident found that nuclear radiation from the Chernobyl reactor in Russia reached Sweden.

Do the Benefits Outweigh the Costs? Let's assume for a moment we all agree that sulfur emissions are health hazards. To correct the problem, how much money should we pay? A guest speaker at the Industrial College of the Armed Forces claims that we spend millions of tax dollars to prevent one cancer death. The point is that we won't know if the benefits outweigh the costs until Congress requires supporting analyses. Once we know the costs and benefits, then we can make intelligent choices.

Why Do We Pay Without Knowing the Real Costs? Dixie Lee Ray was a former governor of Washington, chairperson of the Atomic Energy Commission, and a member of the University of Washington Zoology faculty. She wrote in 1990 that the American public is spending billions of dollars to cure problems without knowing whether they are real.

Media Standards for Accuracy. She claims that environmental alarmists misrepresent science to further their cause. Broadcast time or print space goes to compact, hardhitting stories, with experts providing good one-liner statements. So the media bombards us and our lawmakers with alarming factoids--beliefs that have little or no evidence to support them. It doesn't mean the stories are wrong, just that we don't know the whole story.

Scientific Standards for Accuracy. Scientists strive for proof, repeatability, and quality because their reputation is valuable. However, scientists don't have easy access to the

public without the media. The media and scientists need to collaborate on environmental issues to protect the country.¹²

THE U.S. ROLE IN ENVIRONMENTAL PROTECTION

Should the U.S. Lead? Many countries expect the U.S. to take a lead because of our status as a political, military, and economic superpower. Industrialized countries typically charge that developing nations should use clean technologies, although they may cost more. Developing countries respond that industrialized countries made their money using cheaper, dirtier technology and caused the existing problem. Despite the cause of the problem, all countries will live with its aftermath. The U.S. leads environmental cleanup and protection by adopting tough standards. We can also help by making environmentally clean technology available to developing countries as a goodwill gesture.

The Fuel Issue. U.S. standards for sulfur emissions are tough, but other countries are beginning to follow our lead. The European community presently allows 0.2 percent sulfur in diesel fuel; they will match the U.S. standard of 0.05 percent on October 1996.¹³ This development may constrain DoD's ability to use JP-8 (0.3% sulfur content) in ground vehicles in the European theater; other national policies may similarly restrict U.S. actions in the long-term.

Perhaps the solution lies in a time-phased approach. Let's consider the various options to assess the best course(s) of action.

OPTION 1: LIMIT THE SINGLE FUEL POLICY TO OVERSEAS

This is essentially the policy DoD follows now. Limiting the single fuel policy to overseas locations avoids conflict with the CAA-90 provisions. Units in the United States continue to use Low Sulfur Diesel for highway vehicles. Conversion to a single fuel occurs before deployment or after arrival overseas.

Readiness. National security demands that the U.S. military deploy rapidly, anywhere in the world, and defend U.S. national interests. Units must train under combat conditions to consistently provide decisive results.

Train as You Fight--Use the Same Fuel. Units should use the same fuel during training that they will use in combat. When units deploy overseas and receive different fuel, commanders doubt its reliability. For example, CENTCOM received many complaints from commanders during the Gulf War about using only Jet A-1, the single fuel for that theater. Concerns varied:

- o M-1 tanks had trouble generating smoke in its onboard Vehicle Engine Exhaust Smoke System (VEESS) when using JP-8/Jet A-1.

- o Some units used JP-8 before deployment and felt Jet A-1 was different. Actually Jet A-1 is the same fuel as JP-8,

with the exception that JP-8 has three military additives included in it.

o Units not familiar with Jet A-1 were often reluctant to switch before battle.

In response to the expressed concerns, CENTCOM requested a team of experts conduct an evaluation of the issues surrounding the use of Jet A-1 fuel. The team from the Belvoir Research, Development, and Engineering Center (BRDEC) recommended that CENTCOM allow commanders to use DF-2 since it was available. There was nothing wrong with Jet A-1, but commanders weren't familiar and comfortable with it. Consequently, units that familiar with JP-8 previously used Jet A-1; the other units used DF-2. This essentially ended the DoD's attempt to achieve a single fuel during Desert Shield/Desert Storm.¹⁴ Multiple fuels worked because plenty of fuel and transportation were on hand. That won't always be the case. The idea of single fuel remains valid, but units need to use it in peacetime and war.

Conversion to JP-8 Requires Maintenance. Conversion of ground equipment from diesel to aviation fuel, such as JP-8, generates additional maintenance requirements. Fuel filters rapidly clog after switching to JP-8 or equivalent aviation fuels. Since JP-8 burns cleaner, it loosens DF-2 residue in the fuel system. Changing fuel filters a couple of times eliminates the problem.

Permanent conversion of aircraft from one fuel type to another requires additional maintenance. For example, JP-4 and

JP-8 have different weights and produce different thrust. Maintenance personnel should adjust fuel gages and aircraft capabilities accordingly.

Crisis response may preclude conversion before deployment; military units can't risk equipment failure--clogged fuel filters--when combat may be imminent. The expense and availability of many additional fuel filters can exacerbate readiness and require even more cargo space. Different options will explore how to avoid these dilemmas.

Lack of Single Fuel Affects Sustainment. Fielding a single fuel on the battlefield produces an enormous advantage over multiple fuel types. Supply strategy focuses on the right quantities of fuel to the customer. It doesn't matter whether the customer is an aviation unit or an infantry battalion. Conversely, separate fuels require segregated refuel trucks, storage tanks, manifolds, etc. Consider a delivery of 2,000 gallons of DF-2, 1,000 gallons of JP-4, and 500 gallons of JP-5. This method of supply requires three vehicles and drivers. Using a single fuel, one truck could make the entire delivery. The single fuel policy offers flexibility, simplicity, and saves resources.

Summary of Option 1. Limiting use of the single fuel policy to overseas theaters isn't a viable alternative. Europe adopted the 0.05 percent sulfur standard for 1996--other countries will eventually do the same. The U.S. needs to adopt a low sulfur

fuel now. Using fuels other than Low Sulfur JP-8 jeopardizes U.S. forces upon deployment due to readiness and sustainment problems such as clogged fuel filters and maintenance adjustments.

OPTION 2: CHANGE TO A Low Sulfur KEROSENE JET FUEL

The Army wants 34 million gallons of Low Sulfur JP-8 per year. This would support Army ground and aviation requirements at 14 high priority bases in the U.S. It improves readiness because units use the same fuel before and after deployment.

A long-term goal should be to meet all DoD ground and aviation requirements with Low Sulfur JP-8 (or its equivalent). It would fulfill DoD's pursuit of a single fuel on the battlefield and meet EPA standards for vehicle emissions anywhere in the world.

Current Specifications Don't Meet Sulfur Limits. DoD currently uses three types of kerosene jet fuel in overseas theaters--all of them fail to meet the CAA-90 sulfur standards. Military specifications for JP-8, JP-5, and Jet A-1 allow a maximum sulfur content of 0.30 percent by weight. The CAA-90 mandates a maximum sulfur content of 0.05 percent by weight which is a significant difference.

There are two ways to overcome this problem. First, DoD can switch to an existing low sulfur kerosene jet fuel like Low Sulfur JP-8. Second, if sufficient quantities of Low Sulfur JP-8 aren't available or Low Sulfur JP-8 costs too much, then ask

industry to consider producing an acceptable low sulfur kerosene jet fuel.

Low Sulfur JP-8 is Available. The Defense Fuel Supply Center (DFSC) recently conducted a DoD survey of twenty-one producers who typically bid on DoD jet fuel contracts. Responses suggest that seven refineries produce JP-8 with a sulfur content that meets the EPA specification and six companies produce it part of the time. Three companies expressed an interest in bidding on Low Sulfur JP-8; of the three, only Sun Oil Company sells kerosene jet fuel to DFSC.¹⁵

Would Low Sulfur JP-8 Be More Expensive? The DFSC market survey doesn't address purchase price, but does speculate on transportation, crude oil sources, and storage problems. A worst case scenario is only one

company providing Low Sulfur JP-

8. This could add as much as

\$1.00 per gallon for truck

delivery; a combination of barge

and truck delivery might add

\$.74 per gallon.

1995 STOCK FUND FUEL PRICES

DF-2	\$.83
JP-4	\$.86
JP-5	\$.88
JP-8	\$.86

Most of the refineries currently producing low sulfur jet fuel do so only because their crude stocks happen to be low sulfur. If their source changes, the sulfur content of their jet fuel would also change. Hydrotreating can remove additional sulfur, but it adds cost to the product.

Refiners that produce Low Sulfur JP-8 must dedicate separate storage tanks to maintain its quality. Companies are reluctant to segregate part of their commercial jet fuel tanks to Low Sulfur JP-8. Additional tanks require EPA permits and add cost to the product.

The worst case scenario in the DFSC market survey may not happen for several reasons. When DoD began its conversion from JP-4 to JP-8, most petroleum planners thought JP-8 would cost significantly more. Initially it did, but now the price is the same as JP-4. Could the same hold true for Low Sulfur JP-8?

Ten of the larger companies say their lack of interest is due to the small volume. Make the solicitation more enticing by adding the Air Force and remaining Army requirements; the annual JP-4/JP-5/JP-8 solicitation for CONUS is approximately 2.3 billion gallons.¹⁶ Increasing the volume breeds competition that lowers the price and provides distribution flexibility.

Limited Quantities of Low Sulfur JP-8 Cause Problems. Small quantities of Low Sulfur JP-8 for Army ground equipment require separate handling from other JP-8. It solves the problem of converting Army equipment before deployment. However, handling two kinds of JP-8 doesn't provide the benefits of a single fuel either. Separate storage tanks, refuel trucks, hoses, etc. are necessary for each grade of JP-8. This may be a short-term option, but it doesn't fulfill the intent of a single fuel on the battlefield.

Environmental Considerations. Conversion of the Army's 34 million gallons to Low Sulfur JP-8 should be the initial step to conversion of the entire DoD and the aviation industry to low sulfur jet fuel. Airlines use Jet A-1; the military uses JP-8 which is essentially Jet A-1 with the addition of three military additives. The aviation conversion would further reduce sulfur oxide emissions mandated for highway use. Nationally, airlines consume 9 percent of all U.S. transportation energy. However, in areas with significant air pollution the figure is even higher. Jet fuel is the second largest segment of California's transportation energy use, comprising 17 percent of transportation energy use in 1988. California jet fuel consumption will rise by approximately 25 percent during the 1989-2000 period.¹⁷

The airline community must comply with all aspects of Federal Air Regulation. For example, Federal Aviation Administration regulations for aircraft engines (Federal Air Regulation, Part 34) limit emissions and smoke levels during operations below 3000 feet.¹⁸ Airlines don't know how the CAA-90 changes will affect jet fuel quality. However, trends toward reformulated gasolines and Low Sulfur Diesel Fuel will probably lead to sulfur restrictions on Jet A-1. The driving factor for airline acceptance of Low Sulfur JP-8 or Jet A-1 is price. Since the DoD needs Low Sulfur JP-8, it can help itself and the aviation industry by raising quantities to get the price down.

The Refining Process. Petroleum refining is a complex process involving a variety of chemical interactions between final products. A 1992 Logistics Management Institute study concludes that refinery changes to meet the CAA-90 requirements will not influence jet fuel quality or quantity. One reason is that conventional kero-jet fuels don't compete directly with gasoline for their blendstocks.¹⁹

Summary of Option 2. This option satisfies the CAA-90 standards and keeps military readiness high. Low Sulfur JP-8 is available in CONUS, but it may be cost prohibitive. Potential problems are limited suppliers, significant transportation costs, and storage difficulties. I think DoD should expand the Army's 34 million gallon requirement toward the potential 2.3 billion gallons to obtain more competition and multiple fuel sources. This can reduce the price, decrease transportation distances, and lead the airlines to follow suit. Ultimately, cost will decide whether this option is viable.

OPTION 3: SEEK AN ENFORCEMENT DISCRETION FROM THE EPA

If Low Sulfur JP-8 costs too much, this leaves the DoD with a dilemma. Either military units must accept the security risks of combat fuel conversion, or pay an exorbitant price for Low Sulfur JP-8, or use normal JP-8 with the permission of the EPA. The EPA cannot exempt anyone from the law, but they can discreetly enforce it.

The Criteria. An enforcement discretion recognizes contradictions among laws or situations where standards are unattainable. The EPA provides written guidelines for the agency to follow in return for their discretion not to enforce the standard. For example, the DoD has an EPA enforcement discretion on dyeing aviation turbine fuel blue due to operational safety.

Seek a Country-Wide Enforcement Discretion. A country-wide enforcement discretion allows all CONUS military installations to use normal JP-8 for ground equipment. This provides the maximum flexibility to the DoD to maintain readiness. The disadvantage of this option is that DoD places the EPA in a politically sensitive position. It also ignores the unit priority designator; units have different priorities and deployment times. The Federal Facilities Compliance Act (FFCA) allows state and local governments to enforce their standards on federal facilities within their jurisdiction. Several DoD facilities are within the South Coast Air Quality Management District of California; this is a nonattainment area because their air quality exceeds the EPA standards several days of the year. Allowing military vehicles to burn normal JP-8 would not set well with local politicians.

A Limited Enforcement Discretion. This allows the EPA to keep the compliance percentage very high; it provides DoD the readiness level necessary to ensure national security. My recommendation is to limit the request for enforcement discretion

to a few high priority posts, such as Fort Bragg, Fort Campbell, Fort Hood, etc. High priority posts within nonattainment areas will probably not receive enforcement discretion due to the FFCA. Another option for them is to purchase Low Sulfur JP-8. The cost per gallon may be high, but the quantities can be kept small.

Summary of Option 3. This option isn't as good as using Low Sulfur JP-8, but it is better than converting all units following deployment notification. A country-wide enforcement discretion isn't politically feasible. If Low Sulfur JP-8 costs too much, then the DoD should seek EPA enforcement discretion at high priority bases.

OPTION 4: DON'T COMPLY WITH THE CAA-90

Can DoD Refuse? The DoD leadership recognizes that the military has to comply with local, state, and federal laws and regulations. Consequently, the DoD's own policy requires it to comply with CAA-90. I believe the only time the DoD could use this option is during a national disaster or a military crisis.

What Are the Penalties? The EPA can levy fines and the FFCA allows state and local governments to levy fines. I discussed EPA penalties earlier in the paper. Organizations negotiate the fine with the EPA to correct the problem. In a sense, the guilty party still gains under this arrangement since the fine results in a better company. Disadvantages are the loss of good will and lack of discretion on where money is spent. Furthermore, the

President would not tolerate two executive agencies fighting each other in public. We are supposed to be on the same team.

Summary of Option 4. The DoD shouldn't pursue this option under normal circumstances. No person or agency is above the law. Common sense would dictate the few times an option like would be necessary--national crisis or disaster.

OPTION 5: USE ALTERNATIVE ENERGY

My analyses up to this point focuses on conventional fuel sources. However, there are some possible alternatives on the market or just on the horizon.

What Sources Are Available? Some alternate energy sources that could theoretically power ground vehicles instead of fossil fuels are electricity and natural gas. Although neither of these is in widespread use, it doesn't hurt to explore them.

Electrical Powered Vehicles. Electric powered vehicles still have limited range and power. Battery improvements are the key to this mode of power. Cities like Los Angeles are testing electric powered vehicles for commuters, but they require charging after seventy miles of driving. Companies are testing electric engines in train locomotives. Electric powered vehicles may have DoD applications at CONUS installations, but they are still too limited for use on the modern battlefield. Combat vehicles must be readily available, easily transportable, and highly mobile.

Natural Gas Powered Vehicles. Natural gas is plentiful and clean. Many commercial companies in nonattainment areas reconfigure vehicles to use natural gas because of these advantages. Several heavy duty engine manufacturers are developing natural gas and methanol engines. So the technology is available, but its use isn't widespread. This may be viable for the DoD within a few years.²⁰

Summary of Option 5. This option has little near-term application for the DoD, but it has potential in the future. Technological breakthroughs will determine how fast these alternatives become inexpensive and enjoy widespread use.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions. A conflict exists between the DoD single fuel policy and the CAA-90 standards. The DoD currently uses Option 1 (limit the single fuel policy to overseas--convert CONUS ground units to JP-8 upon deployment notification). This reduces military readiness and weakens national security due to massive filter changes and maintenance adjustments. Option 2 (convert to Low Sulfur JP-8) has the best potential. This option meets readiness requirements and the CAA-90. Low Sulfur JP-8 is available, but it may be too expensive. Option 3 (seek an EPA enforcement discretion) is the second best option for the near-term. If Low Sulfur JP-8 is cost prohibitive, then the DoD can ask the EPA to allow all or part of its ground units to use regular JP-8. Option 4 (not comply with the CAA-90) can only be

used in an emergency. Option 5 (use an alternative energy fuel) has long-term viability. The technology is available, but it is still expensive and not widespread. Also, the military needs vehicles that are highly mobile.

Recommendations. A time phased approach is the best; it can still maintain national security and comply with the CAA-90.

- o First, pursue the use of Low Sulfur JP-8. Increase the quantities to attract industry attention. If it is too expensive, then use it at high priority posts.

- o Second, seek an EPA enforcement discretion to use normal JP-8 at priority installations where Low Sulfur JP-8 isn't available.

- o Third, Monitor alternative energy sources for future use.

- o Finally, if none of the above is possible, then DoD must prestock large quantities of fuel filters and convert vehicles to JP-8 before deployment when possible.

POSTSCRIPT: A 23 March 1994 collision between an F16D and a C-130 resulted in the deaths of 23 Army paratroopers and injured 80 more at Pope Air Force Base. The C-130 landed safely and both F-16 pilots ejected, but the damaged F-16 plowed into two C-141 Starlifters. Five hundred paratroopers waiting to board for a practice jump were engulfed in a huge fireball. All three planes were fueled with highly volatile JP-4; Pope Air Force Base converts to JP-8 in early April 1994. The initial investigation concludes that JP-4 compounded the severity of the accident when

the F-16D impacted on the runway. An explosion would still occur, but the collateral damage and burn severity would be less with JP-8. Once ignited, a JP-4 fire spreads at about 12 feet per second, compared with one 0.14 feet per second with JP-8.²¹

This unfortunate incident highlights the necessity to convert to JP-8 rapidly--for all requirements. The United States can't afford to sacrifice safety and national security when it conflicts with environmental security.

ENDNOTES

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GLOSSARY

Jet Fuel: Jet fuels are used in aircraft turbine engines, ramjet engines, and rocket engines and other turbine powered equipment. These fuels are derived from petroleum as are gasolines. Jet fuels can't be used in reciprocating type (piston-type) aircraft engines. (MIL-HDBK-201B)

Jet A-1: The standard fuel used by all commercial airline companies worldwide, except within the U.S. where Jet A is principally used. Jet A-1 differs from Jet A only in its lower freeze point requirement.

JP-4: An aviation turbine fuel made from a 40:60, 50:50, or 60:40 mixture of kerosene with gasoline-type blending stock. It is called a "wide-cut fuel." It isn't usually considered as an acceptable substitute for diesel-fueled equipment.

JP-5: A kerosene-type aviation turbine fuel. It has a high flashpoint specification of 140°F (minimum). This fuel is used for all sea-based aircraft because of a safety requirement for on-board aircraft carrier operations.

JP-8: A kerosene-type aviation turbine fuel. JP-8 is essentially Jet A-1 with the addition of three military additives. It has a 100°F (minimum) flashpoint specification.

Diesel Fuel: Fuels used in compression ignition engines in which air enters the engine at atmospheric pressure or is forced in under higher pressures by a pump or blower. In a diesel engine, fuel is injected into a combustion space through an injection nozzle which breaks up the fuel into a fine spray and fuel vapor which is ignited by the heat of the air in the cylinder. The air obtains its heat as a result of being compressed by the piston. Diesel fuels are used to operate compression engines in submarines, destroyer escorts, landing craft, auxiliary equipment aboard larger craft as well as buses, heavy trucks, tractors, railroad diesel locomotives, stationary plants, and in other auxiliary units. (MIL-HDBK-201B)

DF-A: A diesel fuel intended for use in high speed automotive type diesel engines and in pot type burner space heaters, in areas where ambient temperatures lower than -25°F occur.

DF-1: Diesel fuel intended for use in high speed automotive service in areas in which ambient temperatures reach -25°F.

DF-2: Diesel fuel intended for use in all automotive high speed engines in areas in which ambient temperatures are above 0°F.

Note: DF-A and some DF-1 fuels are essentially kerosene, which is very similar to JP-8. (BRDEC, JP-8)

Automotive Gasoline (MOGAS): Gasolines are used to fuel spark ignition internal combustion engines which power motor vehicles, combat vehicles, portable auxiliary power plants, and stationary units. (MIL-HDBK-201B)